"Sensors with Wings"

Tailored Small UAV Systems for Earth Science Research

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High Altitude UAVs: NASA's Traditional Focus

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Small UAVs for Earth Science

Commercially Produced and Operated Platforms

Modified RC Models

Radio Control Prototypes

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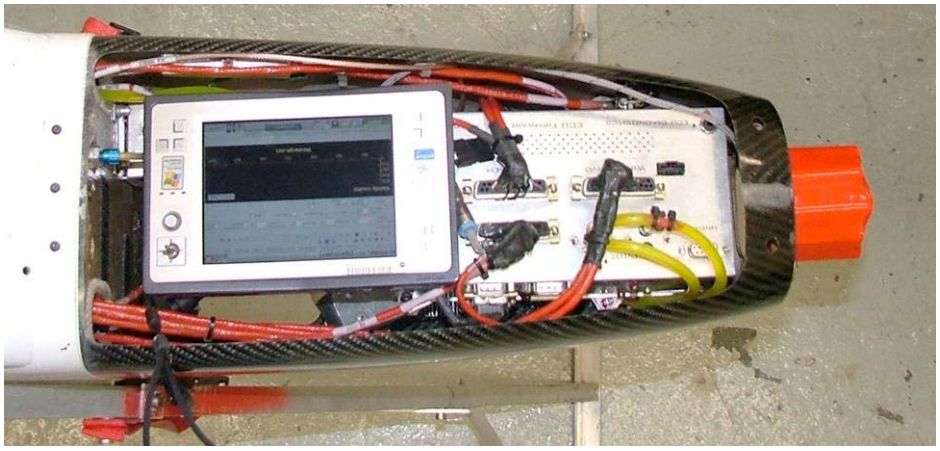
Microspectrometer for Ocean Color



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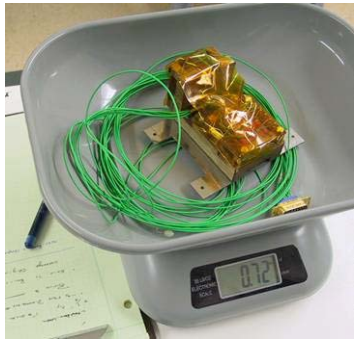
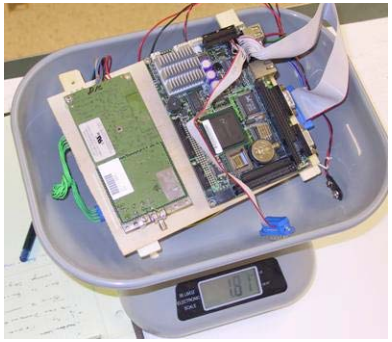
MagPlane





- Magnetometer for *Iturralde Crater Expedition (ICE 2002),* Waselewski, et al
- Instrument and Data Systems Exceeded Volume and Weight Limits (>40 lb Gross Weight)
- Deployed to Bolivia

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“UAVs are not for the Faint of Heart”

(industry executive)

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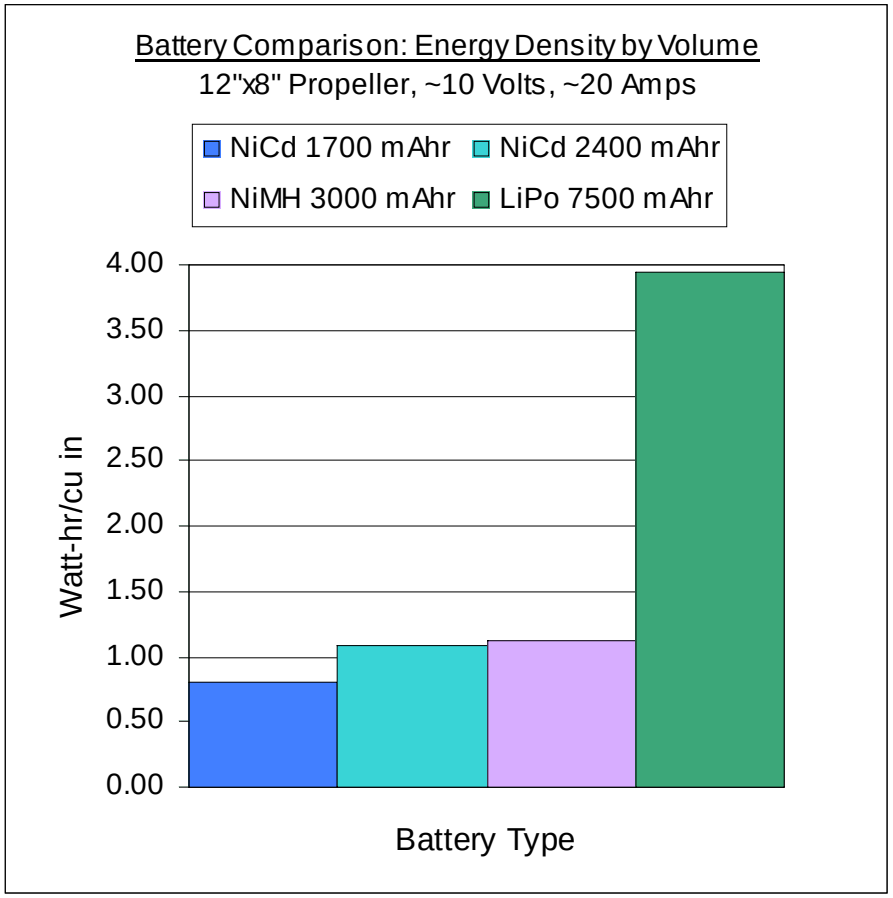
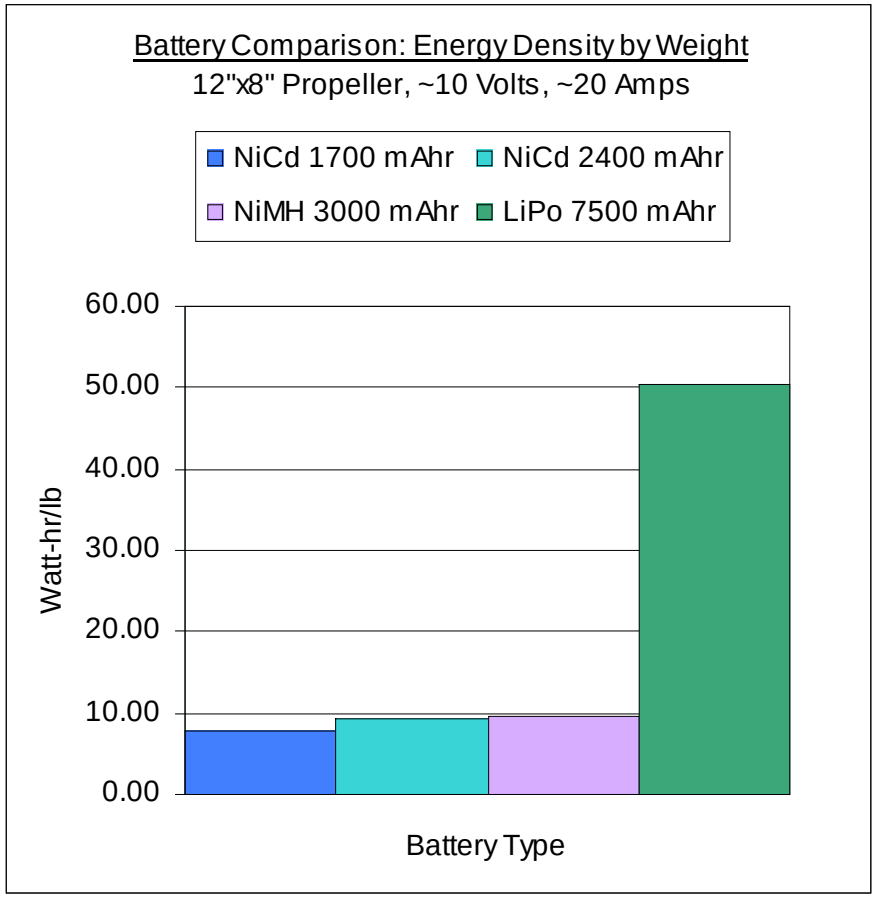
Electric Propulsion

Significant Evolution of Battery Technology





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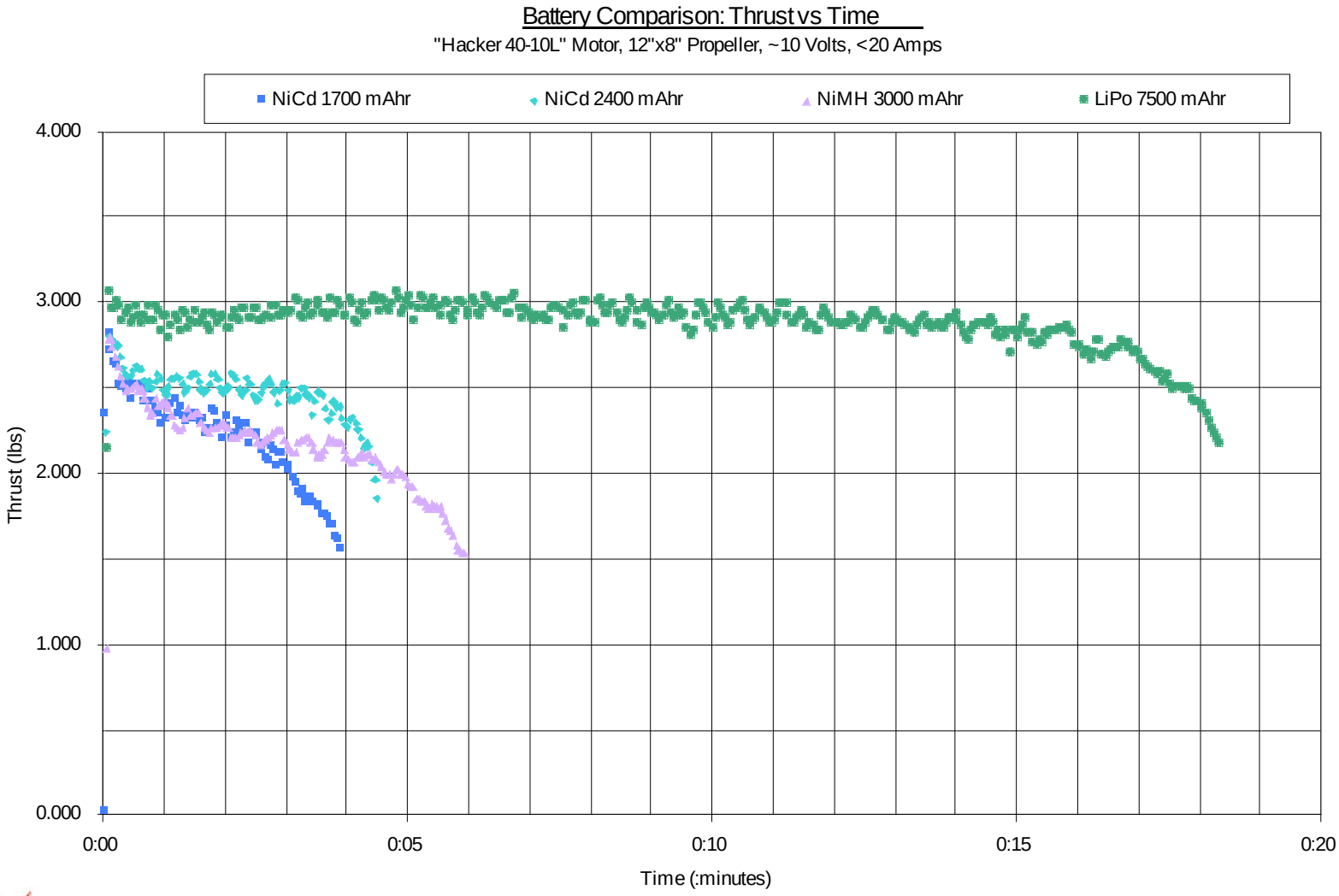
Electric Propulsion

Tests with Batteries of Similar Mass



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Infrared Imaging

ImageAire

Aeros 100

Color

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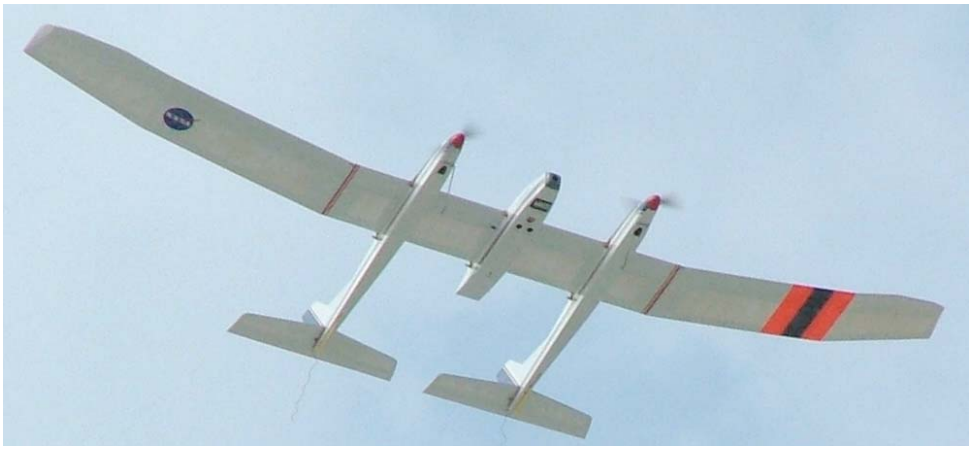
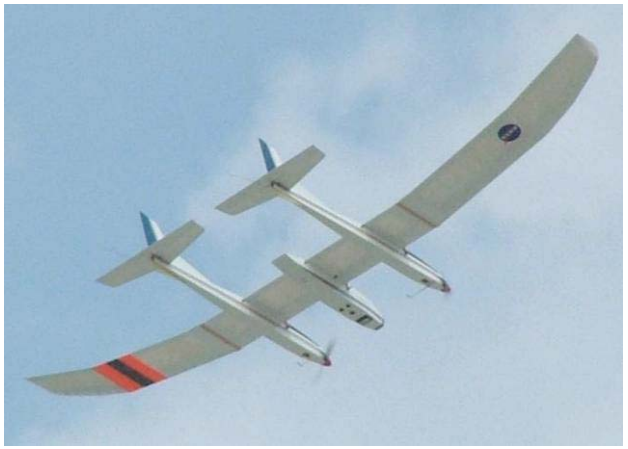
Infrared

ImageAire Lite ii

Very-Mini UAV for Geothermal Observations





- Created for geothermal mapping experiments in Yellowstone National Park
- Suitable for agricultural research and sensor tests
- Infrared, visible, and narrow band (filtered) cameras with real-time video link
- Includes GPS, temperature, humidity, and pressure measurements, provisions for miniature *Anasphere* carbon dioxide sensor
- Six pound total weight, assembles in ten minutes
- Suitable for standard shipping

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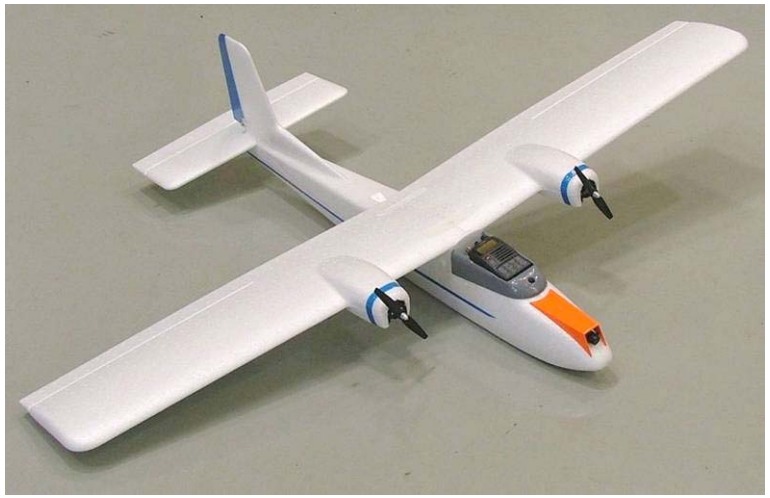
Other *Very-Mini* UAV Examples

Microprobe (4.5 lbs): Visible, Thermal IR Video Downlink, GPS, T/RH/P Follow-on to *ImageAire* series, *Aeros 100 & 200* (Coronado, et al)

XPi-SO2-1 (2.5 lbs) with Sulfur Dioxide Sensor for Volcano Plume Research (Pieri, et al)



Critter Chaser with embedded Yagi antenna and receiver for Animal Tracking (Wilkelski, et al)

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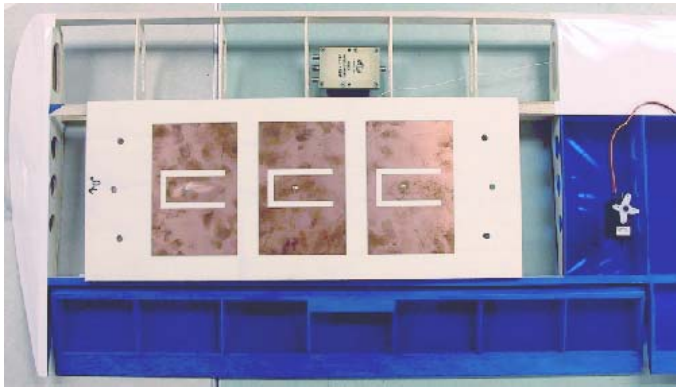
Radstar/Aerotenna



- Miniaturized L-Band Radiometer
- 100 meter Resolution Goal
- Salinity, Soil Moisture, Snow, Ice
- 12 lb Operating Weight

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Airborne Science Training Initiative (ASTI)

- Ultra-Low-Cost Training and Imaging UAVs
- UMES Aviation, Science, Engineering, & Technology Students & Faculty
- Includes Industry, Other University, Other Government Agency Participants

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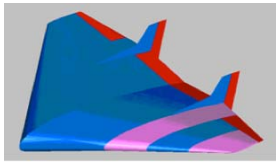
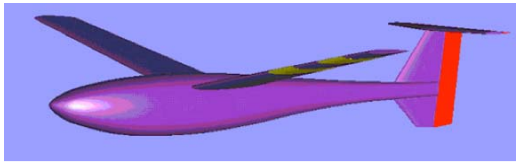
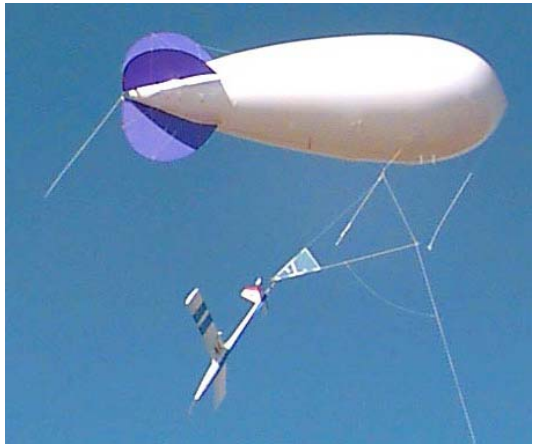
Aeroids for Cloud/Storm Research





- *Ultra-Mini,* Balloon-Launched Probes
- 1-6 lbs: Compare to Radiosondes and FAA/FAR Part 101
- Miniature Sensors and Systems are Emerging
- Potentially Suitable for Volcano Research



XAP: Balloon Launched Mini-UAV Proof-of-Concept Tests 1993-2001

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